

New species of *Eupithecia* (Lepidoptera, Geometridae) from China, part V

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Abstract 12 new species of *Eupithecia* (Lepidoptera, Geometridae) are described from China.

Key words Revision, *Eupithecia blenna* sp. n., *Eupithecia verprota* sp. n., *Eupithecia spissata* sp. n., *Eupithecia nirvana* sp. n., *Eupithecia serpentigena* sp. n., *Eupithecia fulvidorsata* sp. n., *Eupithecia atuni* sp. n., *Eupithecia phantastica* sp. n., *Eupithecia actrix* sp. n., *Eupithecia severa* sp. n., *Eupithecia magica* sp. n. and *Eupithecia villica* sp. n., taxonomy.

Introduction

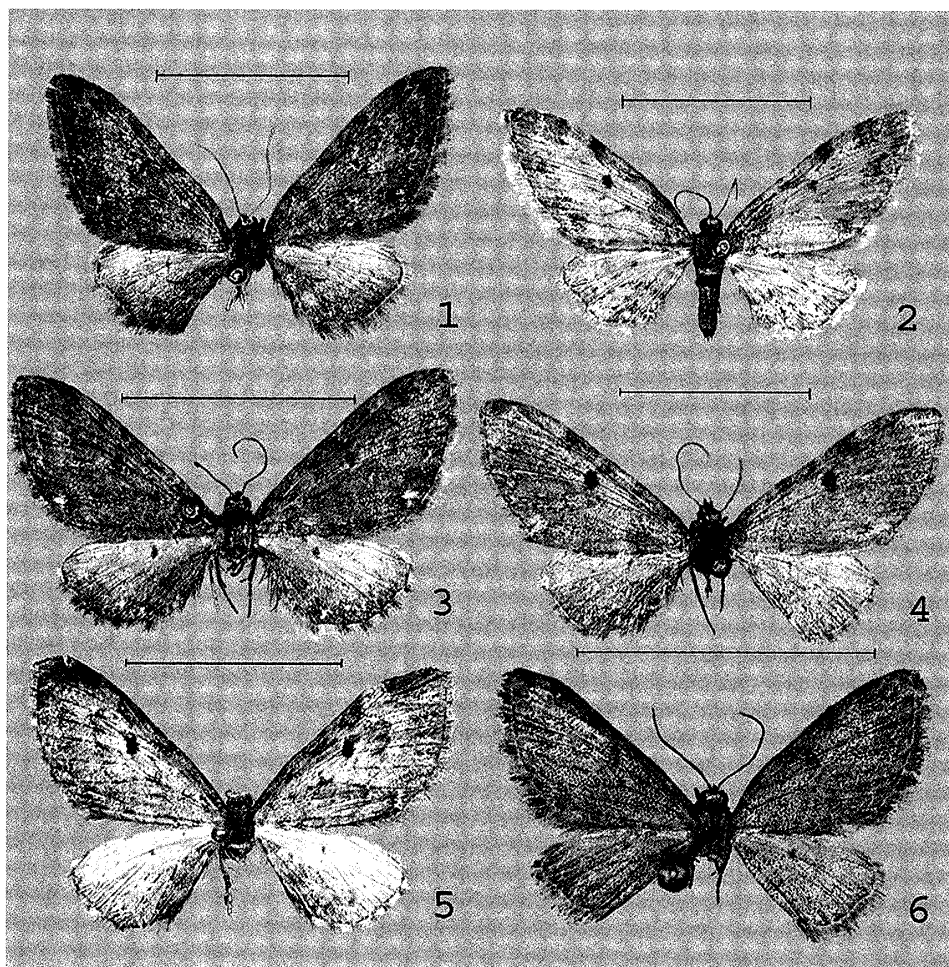
This is the fifth in a series of papers describing new species of Chinese *Eupithecia* from collections in Bonn and Munich, the background to which was given in the first four papers (Mironov *et al.*, 2004a, b, c, d). The purpose of these papers is to publish details of new species (in many cases discovered in newly collected material) in advance of the publication of a general review of the genus in China. In this paper we describe a further twelve new species (*E. blenna* sp. n., *E. verprota* sp. n., *E. spissata* sp. n., *E. nirvana* sp. n., *E. serpentigena* sp. n., *E. fulvidorsata* sp. n., *E. atuni* sp. n., *E. phantastica* sp. n., *E. actrix* sp. n., *E. severa* sp. n., *E. magica* sp. n. and *E. villica* sp. n.).

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Abbreviations: ZFMK: Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (Germany); ZSM: Zoologisches Staatssammlung München (Germany); ZISP: Zoological Institute RAS, Saint-Petersburg (Russia); IZCAS: Institute of Zoology, Chinese Academy of Sciences, Beijing, China.

Eupithecia blenna Mironov & Galsworthy, **sp. nov.** (Fig. 1)

Description (♂♀). Wingspan 22.5–24 mm; fore wing 13–13.5 mm. Fore wing elongate with slightly bowed costa, oblique termen and pointed apex (in the two paratype males the fore wings are narrower, more elongate and pointed than in the female); ground colour dark brownish grey; transverse lines inconspicuous except postmedian, which is oblique, and right angled near costa behind discal dot; terminal area slightly darker with narrow, crooked whitish subterminal line and small tornal spot; terminal line narrow, brownish black, finely interrupted at vein endings; discal dot small, narrow and oblique, black. Fringes brownish grey, slightly chequered brown. Hind wing elongate, rather dirty white along costa and in

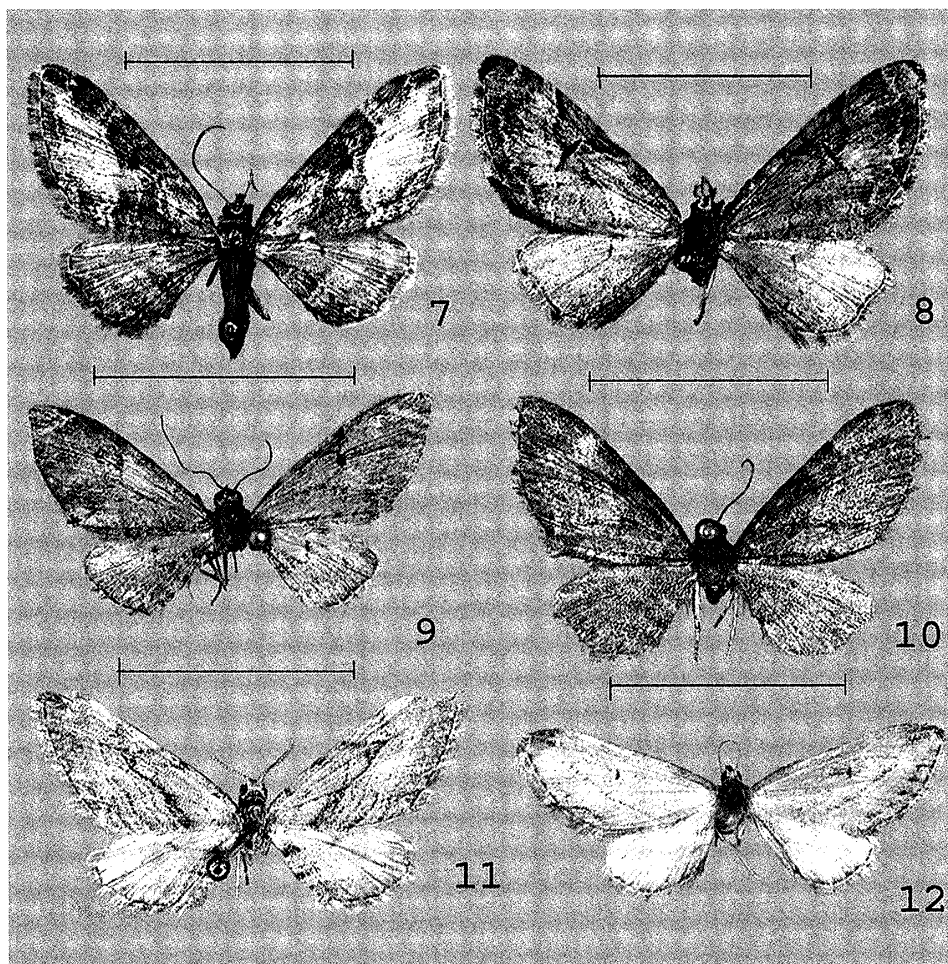


Figs 1-6. *Eupithecia* adults (Scale bar=1 mm). 1. *E. blenna* sp. nov. 2. *E. verprota* sp. nov. 3. *E. spissata* sp. nov. 4. *E. nirvana* sp. nov. 5. *E. serpentigena* sp. nov. 6. *E. fulvidorsata* sp. nov.

the middle and brownish grey along terminal and anal margins; postmedian line well marked near anal margin; terminal line and fringes as fore wing; discal dot minute, rounded, dark brown, smaller than on the fore wing.

Male genitalia (Fig. 13). Uncus short and narrow, biapical. Valve narrow, slightly curved, sharply tapered to apex, with very narrow, rounded apex; broad ventral processes close to bases of valves, asymmetrical: narrower and more rounded on the right valve, broader and obtuse on the left valve; sacculus heavily sclerotized. Vinculum rather short and wide, almost a semicircle. Papillae on the anterior arms of labides elongate and narrow. Aedeagus long and slim, equal to length of valve. Vesica multiply granulate, with numerous oblique wrinkles, armed with one long plate which has thickened longitudinal margins and one small irregular plate near ductus ejaculatorius base. Sternite A8 small, short, peg-like, with relatively broad and rounded, narrowly sclerotized apex and with a less sclerotized medial blotch nearer to base; lateral margins stronger sclerotized; basal hollow very shallow.

Female genitalia (Fig. 16). Bursa copulatrix large, ovate, membranous, covered with dense spines of varying sizes on the right side, ranging from very small near base and gradually increasing towards colliculum. Ductus bursae almost absent, spineless. Ductus seminalis uncinat, recurved, attached to corpus bursae near its base at the left side. Colliculum col-



Figs 7–12. *Eupithecia* adults (Scale bar=1 mm). 7. *E. atuni* sp. nov. 8. *E. phantastica* sp. nov. 9. *E. actrix* sp. nov. 10. *E. severa* sp. nov. 11. *E. magica* sp. nov. 12. *E. villica* sp. nov.

lar-like, short and relatively broad. Antrum membranous. Tergite A8 almost square, slightly broadened towards the posterior edge, with rounded posterior angles. Anterior and posterior apophyses short and narrow. Papillae anales medium-sized, rather broad and rounded.

Range. Central China. Known from Sichuan and Shaanxi provinces.

Similar species. This species belongs to the *proterva* group. Externally it can be distinguished, with difficulty, from *Eupithecia clavifera* Inoue, 1955 by the slightly larger wingspan. The male and female genitalia can easily be distinguished from those of *E. clavifera* and other East Asian allied species. The male genitalia are more or less similar to those of *E. costiconvexa* Inoue, 1979, but the valve is narrower, with asymmetrical ventral processes, the vinculum broader, rather trapezium-like, the papillae on the anterior arms of the labides longer, and the eighth sternite with an obtuse, rounded apex, without apical rods. The female genitalia are rather similar to those of *E. subfumosa* Inoue, 1965; however, this latter has almost uniform spines in the bursa copulatrix, a narrower colliculum and longer anterior and posterior apophyses.

Holotype. ♀, C. China, prov. Shaanxi, Foping Natural Reserve, Panda area, 1,600 m, 6–11. iv. 1999, 33°45'N 107°48'E, leg. V. Siniaev & A. Plutenko (ZFMK). Paratypes. 1 ♂, locality as holotype, 15–20. iv. 1999, 33°45'N 107°48'E, leg. V. Siniaev & A. Plutenko (ZFMK);

1 ♂, China-Sichuan, Daxue Shan, Gongga Shan, NW Moxi, 29°41'E 101°58'N, 23. iv–15. v. 2001, 2,600–3,200 m, leg. V. Siniaev & A. Plutenko, *ex coll.* Dr A. Schintlmeister (ZSM).

Remarks. The two paratype males are in worn condition; their eighth sternites differ slightly from one another by the shapes of the basal lobes.

***Eupithecia verprota* Mironov & Galsworthy, *sp. nov.* (Fig. 2)**

Description (♂♀). Wingspan 20–23 mm; fore wing 11.5–12.5 mm. Fore wing elongate, narrow, pointed, with slightly bowed costa and termen; ground colour pale grey; basal area brownish; median lines inconspicuous, forming two broad, brown costal spots; terminal area darker, brownish with light, narrow tornal spot; terminal line narrow, dark brown, interrupted at the vein endings; discal dot moderately large, circular, black. Fringes long, pale grey, chequered brown at vein endings. Hind wing elongate, with concave termen and tapered apex; ground colour pale, whitish grey; transverse lines clear, wavy, brownish; basal area brown near anal margin; terminal line and fringes as fore wing; discal dot circular, smaller and paler than on the fore wing.

Male genitalia (Fig. 14). Uncus short, relatively slender, biapical. Valve narrow, broadened basally with prominent blunt ventral process; sacculus heavily sclerotized. Vinculum large, wide, semicircular. Papillae on the anterior arms of labides short and wide. Aedeagus stout, slightly curved, broadened anteriorly, equal to length of valve. Vesica covered with numerous minute dentate spikes; armed with one long curved plate with thickened longitudinal margins and one small irregular plate near ductus ejaculatorius base. Sternite A8 very wide, almost triangular, with prominent and wavy lateral margins, more sclerotized medially; basal hollow shallow; apical hollow very small.

Female genitalia (Fig. 18). Bursa copulatrix large, ovate, almost completely covered with dense spines of varying sizes except in areas near base of ductus seminalis, colliculum and a curved area between base of ductus seminalis and colliculum on the ventral side; medial spines larger than basal and apical. Ductus bursae not clearly expressed. Ductus seminalis broadened near base, curved backwards, attached to corpus bursae near its base on the left side. Colliculum collar-like, elongate and relatively narrow. Antrum slightly sclerotized, covered by numerous pores. Tergite A8 rather elongate, slightly broadened posteriorly, with a shallow medial hollow on the posterior margin, rounded posterior angles and a narrow more sclerotized medial area. Anterior and posterior apophyses relatively long and narrow, slightly expanded to tips. Papillae anales medium-sized, rather narrow and tapered.

Range. Central China. Known from Shaanxi province.

Similar species. This species belongs to the *proterva* group. It is distinguished from other allied species of this group by the lighter pale grey colour of the wings, the indistinct median lines and the presence of dark costal spots on the fore wings. It most resembles large and light specimens of *Eupithecia subbreviata* Staudinger, 1897, which is easily distinguishable in the male genitalia, since the valves lack the saccular extension. In the male, the shape of the valves, with a more prominent, blunter ventral process, the very broad eighth sternite, and in the female the different shape of the bursa copulatrix, the different disposition of spines in the corpus bursae and the elongate, narrow colliculum easily distinguish this new species from two other closely related species *E. proterva* Butler, 1878 and *E. nipponaria* Leech, 1897.

Holotype. ♂, C. China, prov. Shaanxi, Foping Natural Reserve, Panda area, 1,600 m, 6–11. iv. 1999, 33°45'N 107°48'E, leg. V. Siniaev & A. Plutenko (ZFMK). Paratypes. 4 ♂ 3 ♀,

locality as holotype, but 3 ♂ with date 15–20. iv. 1999 (ZFMK; 1 ♂ 1 ♀ in ZISP).

Remarks. The name “*verprota*” is an anagram of the species name “*proterva*”.

***Eupithecia spissata* Mironov & Galsworthy, sp. nov. (Fig. 3)**

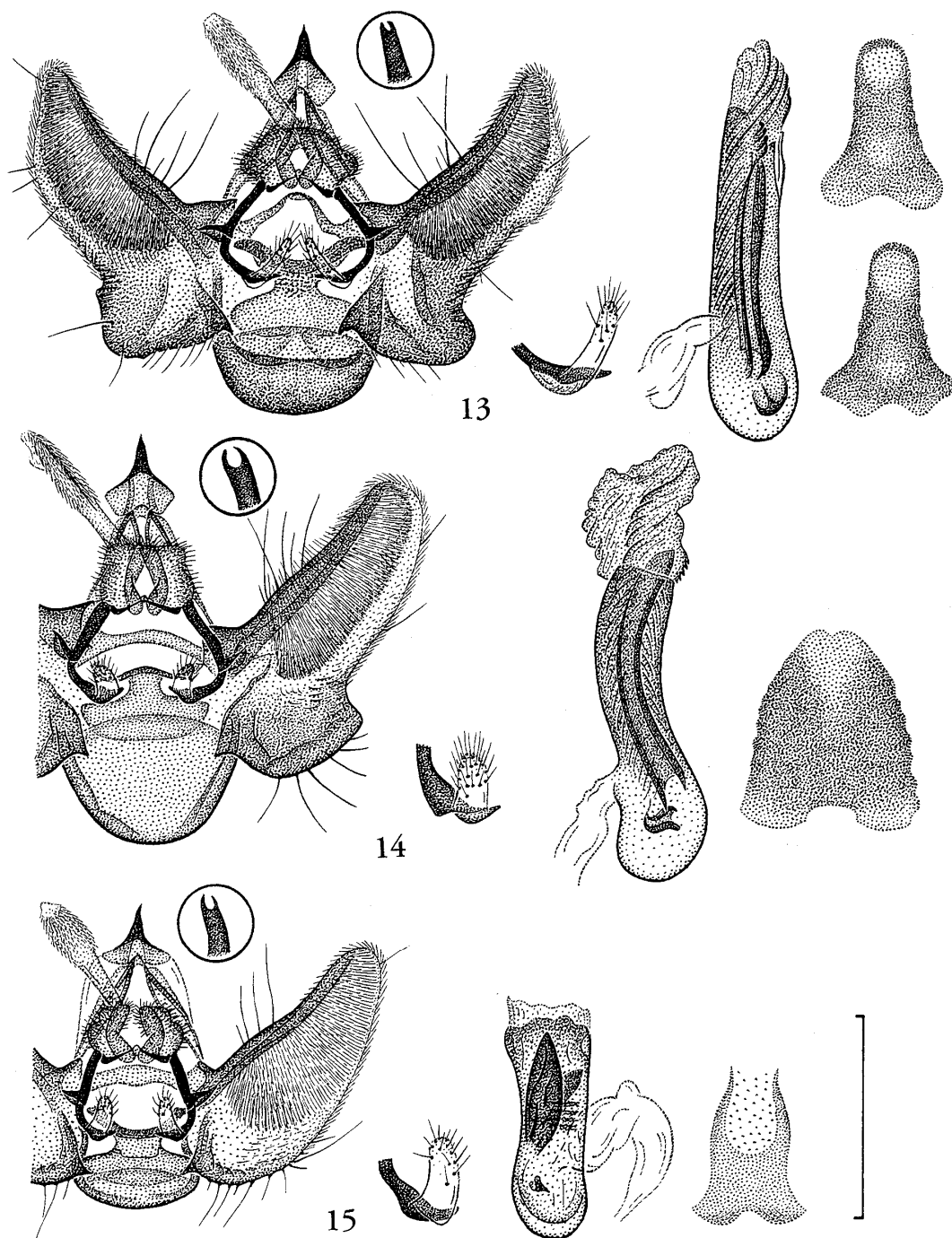
Description (♂ ♀). Wingspan 20 mm; fore wing 11 mm. Fore wing slightly elongate; costa and termen slightly bowed; apex tapered; ground colour brownish grey; transverse lines indistinct, except to some extent oblique postmedian line which forms a series of black dashes on the veins and is obtusely angled onto the costa; terminal area slightly darker with poorly visible, light and narrow, wavy subterminal line and clear rounded, whitish tornal spot; terminal line narrow, black, continuous; discal dot moderately large, ovoid, black; fringes chequered pale grey and brown. Hind wing elongate with termen slightly concave near apex; ground colour pale, whitish grey along costa and in the middle, and darker, grey along terminal and anal margins; terminal area with clear, narrow, wavy, whitish subterminal line and small, white tornal spot; terminal line and fringes as fore wing; dark discal dot circular or ovoid, smaller and paler than on the fore wing.

Male genitalia (Fig. 15). Uncus small, rather short and slim, biapical, with broad and narrow basal lobes. Valve shaped like an orange segment, evenly tapered to apex, with narrowly rounded apex and without ventral process; sacculus lightly sclerotized. Vinculum small, very short, medium width, gently curved. Papillae on the anterior arms of labides medium-sized, rather broad and slightly curved. Aedeagus short and stout, shorter than valve length. Vesica armed with one large and broad, fusiform cornutus, one smaller, obtusely pointed, obliquely situated cornutus and one very small, irregular plate near ductus ejaculatorius base. Sternite A8 small, with two narrow, tapered rods; membranous apical hollow broad and deep; basal hollow shallow.

Female genitalia (Fig. 17). Bursa copulatrix elongate, rather pouch-like, broadened basally, heavily sclerotized at base especially on the right side, with short and broad, thick-walled diverticulum near its base; an S-shaped patch of relatively small dense spines covers one side of the corpus bursae, while a separate patch of dense, larger, stout spines is placed at its ventral side near the base. Ductus bursae not clearly separate and colliculum absent. Ductus seminalis long and narrow; attached to corpus bursae towards its base on the left side. Antrum broad, membranous. Tergite A8 small, trapezoid with rounded posterior angles. Anterior and posterior apophyses elongate, narrow and tapered. Papillae anales medium-sized, slightly elongate and rounded.

Range. China. Known from Sichuan province.

Similar species. This species belongs to the *undata* group. On the basis of the structure of the male and female genitalia, *E. spissata* is allied to *Eupithecia homogrammata* Dietze, 1908 and *E. pygmaeata* (Hübner, 1799). However, it is externally quite different from both these species. *E. spissata* is distinguished from *E. homogrammata* and *E. pygmaeata* by the larger elongated wings, the presence of conspicuous dark discal dots and larger white tornal spots on the fore wings; the absence of light wavy transverse lines on all wings and the lighter hind wings with clear small discal dots. The male genitalia of this new species can easily be distinguished from those of both compared species by the shapes of uncus, valve, vinculum, cornuti on the vesica and eighth sternite. The female genitalia are closer to those of *E. pygmaeata*, but can be easily distinguished by the different disposition of spines, the presence of a dense group of large spines on the ventral side of the bursa copulatrix, the spineless heavily sclerotized area near the base of the corpus bursae, the broader, shorter and thick-walled diverticulum at the base of the corpus bursae, and the narrower eighth ter-

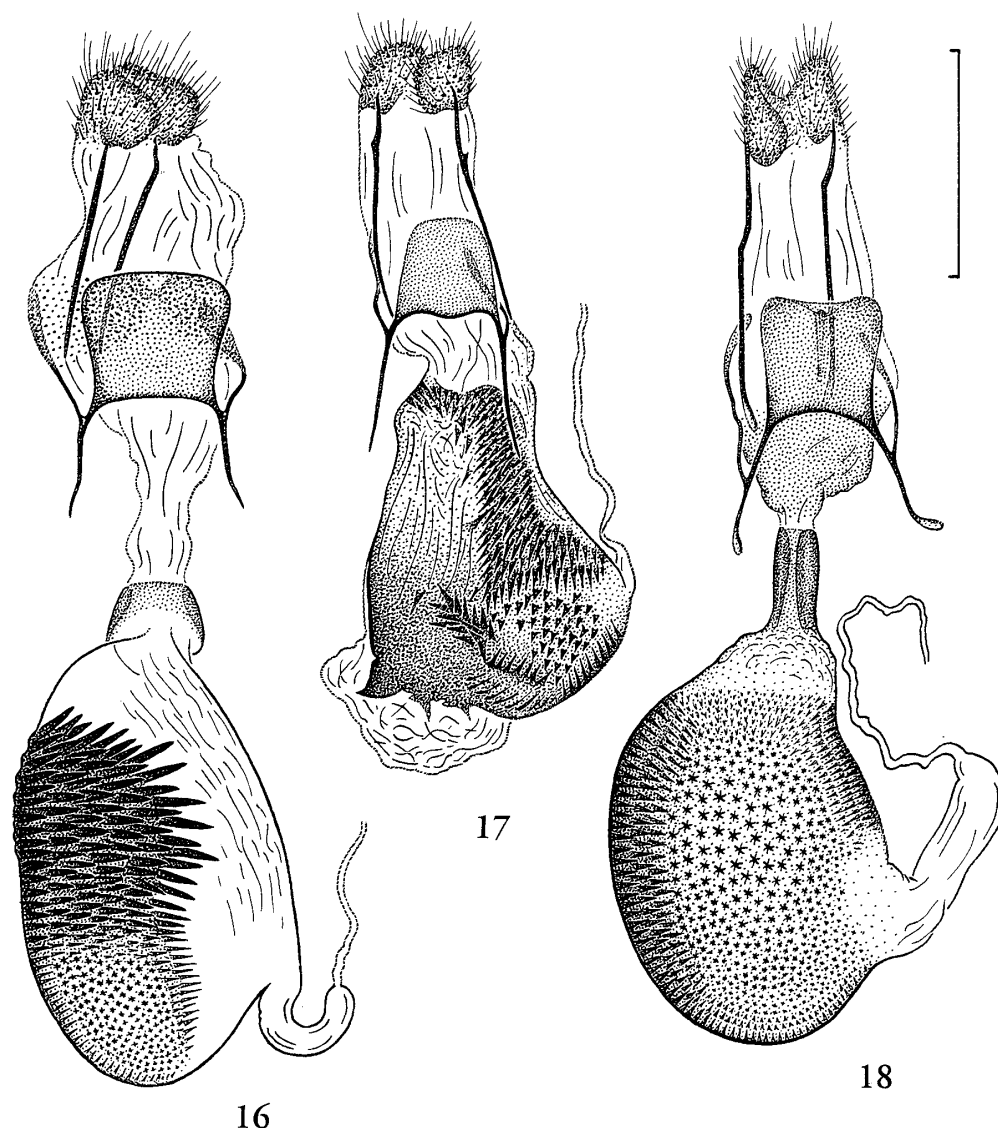


Figs 13–15. Male genitalia of *Eupithecia* species (scale bar=1 mm; with sternite A8; lateral view of uncus and papilla on the anterior arm of labides enlarged). 13. *E. blenna* sp. nov. 14. *E. verprota* sp. nov. 15. *E. spissata* sp. nov.

gite and longer apophyses.

Holotype. ♀, China, Sichuan, Daxue Shan Mts., Gongga Shan, W Moxi, 29°34'N 101°59'E, ca 3,200 m, 20–21. vii. 1999, leg. V. Siniaev & A. Plutenko (ZFMK). Paratype. 1 ♂, locality as holotype (ZFMK).

Remarks. The single paratype male is in a worn condition.



Figs 16–18. Female genitalia of *Eupithecia* species (scale bar=1 mm). 16. *E. blenna* sp. nov. 17. *E. spissata* sp. nov. 18. *E. verprota* sp. nov.

***Eupithecia nirvana* Mironov & Galsworthy, sp. nov. (Fig. 4)**

Description (♂♀). Wingspan 21.5–25 mm; fore wing 12–13.5 mm. Fore wing rather narrow and elongate with tapered apex; costa and termen slightly bowed; ground colour brownish grey, unicolorous; transverse lines inconspicuous, forming three dark spots on costal margin; terminal line brown, narrow and continuous; white tornal spot large and clear, with inner dark shade; discal dot large, ovate or semicircular, black. Hind wing rather narrow and elongate with concave termen near apex and narrowly rounded apex; ground colour as fore wing but lighter near costal margin; transverse lines inconspicuous; terminal line as fore wing; whitish tornal spot and dark discal dot are clear but smaller than those on the fore wing.

Male genitalia (Fig. 19). Uncus rather short and slim, biapical. Valve large, elongate and broad with widely sclerotized costal margin and a single spine on the costa near the apex; ventral margin with a shallow medial hollow; apex tapered; sacculus sclerotized, covered

with numerous minute pores. Vinculum short and wide, tapered anteriorly. Papillae on the anterior arms of labides elongate and tapered to tips. Aedeagus large, long and stout, equal or slightly shorter than length of valve. Vesica armed with one long horn-like cornutus, equal to length of aedeagus, with a broad and curved base and slightly broadened near apex, one parallel but thinner, shorter and less sclerotized styloid cornutus and one elongate, twisted plate with a hooked ending near ductus ejaculatorius base. Sternite A8 large, broadened basally, with two narrow, parallel apical rods with weakly broadened and blunt tips; apical hollow membranous, narrow and deep; basal hollow broad and shallow.

Female genitalia (Fig. 22). Bursa copulatrix heavily sclerotized, funnel-shaped with two lateral rounded promontories close to colliculum and a spineless thick-walled sac near base; covered with mainly small spines in the medial part and with a V-shaped chain of large spines on the middle of the ventral side of the corpus bursae; a large, spherical, membranous diverticulum with a narrow tubulate base attached to median part of corpus bursae from ventral side. Ductus bursae not well developed. Ductus seminalis short, broadened basally; attached to median part of corpus bursae from dorsal side. Colliculum almost plate-like, broad, heavily sclerotized as bursa. Antrum broad, poriferous, heavily sclerotized. Tergite A8 short and broad, trapezoid with shallow medial hollow on the anterior margin. Anterior and posterior apophyses very short, rather thick. Papillae anales relatively large, broad and rounded.

Range. China. Known from Sichuan province.

Similar species. This species belongs to the *undata* group. It is most similar to *Eupithecia vana* Vojnits, 1979 and can easily be confused with it: it can generally be distinguished by the larger size, the more elongate and pointed fore and hind wings, the less dark costal spots and the rather larger discal dots on the fore wings. The male genitalia of *E. nirvana* have a slightly shorter tip to the uncus with the base less broad, a longer apical spine on the valve with a less broad and prominent base, a tapered vinculum without medial hollow, a shorter horn-like cornutus with less broadening at the apex, and only one styloid cornutus on the vesica (*E. vana* has two similar styloid cornuti); the apical rods of the eighth sternite are also slightly broader and more rounded than in *E. vana*. The female genitalia of *E. nirvana* are easily distinguished from those of *E. vana* by the funnel-shaped bursa copulatrix with a different disposition of spines, the shorter and broader diverticulum at the base of the corpus bursae and the shorter anterior apophyses.

Holotype. ♂, China, Sichuan, Daxue Shan Mts, Gongga Shan, NW Moxi, 29°41'N 101°58'E, 14–19. vii. 1999, ca 2,850 m, leg. V. Siniaev & A. Plutenko (ZFMK). Paratypes. 5 ♀, locality as holotype, but 2 ♀ were collected at altitude about 3,200 m, 29°34'N 101°59'E, 20–21. vii. 1999 (ZFMK and 2 ♀ in ZISP).

***Eupithecia serpentigena* Mironov & Galsworthy, sp. nov. (Fig 5)**

Description (♀). Wingspan 21 mm; fore wing 12 mm. Fore wing relatively broad, costa slightly bowed, apex rounded, termen gently curved. Ground colour pale grey, darker at apex and marginal area. Two conspicuous dark patches on costa. Inner and median transverse lines not expressed, postmedian present as a narrow black crenulate line, sharply angled at level of discal dot and running inwards to connect with outer dark patch on costa; a broad grey postmedian fascia outside postmedian line. Discal dot black, large and square. Terminal line dark brown, fringes grey. Hind wing rounded triangular, clear white, with marked grey-brown shading in whole area of anal margin. Discal dot small, round. Terminal line brown, fringes chequered white and grey-brown.

Female genitalia (Fig. 24). Very distinctive. Bursa copulatrix small, globular, membranous, almost completely covered with very small, thin spines except area near ductus seminalis base. Ductus bursae broad, elongated, slightly curved, with sclerotized band along the middle, also with prominent diverticulum at right side and two small patches of small spines (one apical and the other larger, U-shaped, in the middle of the ductus bursae). Ductus seminalis long and narrow, sharply broadened at base, broadly attached to the middle part of the corpus bursae from left side. Colliculum not evident. Antrum broad, membranous. Tergite A8 small, narrow and slightly elongate, trapezoid, with rounded posterior corners. Anterior and posterior apophyses rather short and narrow. Papillae anales small, short and rounded.

Male unknown.

Range. Known only from the holotype specimen, which was collected at 1,100 m in the Wanglang nature reserve north of Chengdu in Sichuan province.

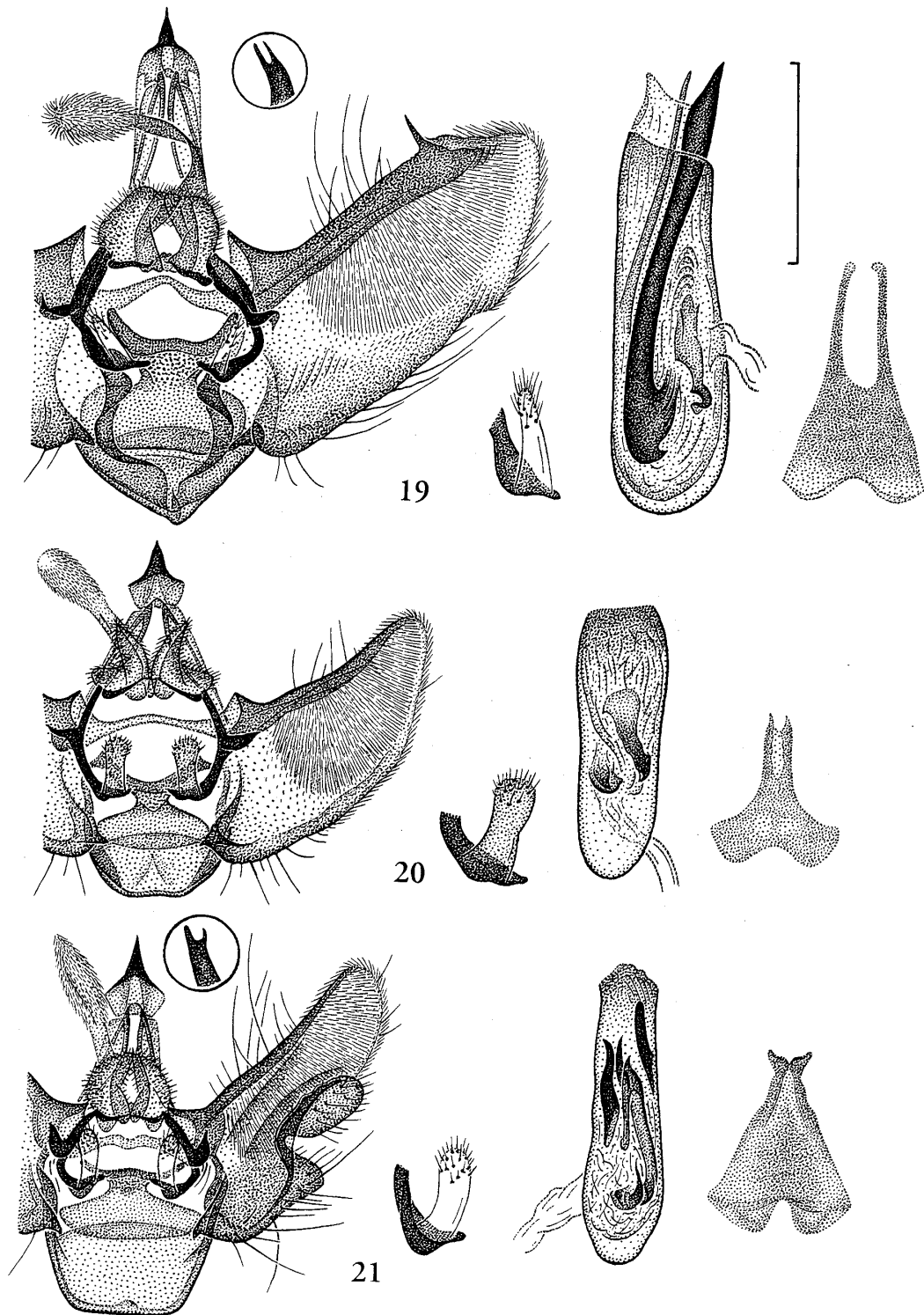
Similar species. In outward appearance, the combination of a strong discal dot, a strongly crenulate postmedian line, a broad grey postmedian fascia, and a generally grey cast to the fore wing are distinctive. The coloration and pattern is similar to *amicula* Mironov & Galsworthy, 2004, but the postmedian is a different shape, and the discal dot stronger. Externally the species also resembles *stataria* Inoue, 1988, which however has very different genitalia. The female genitalia in fact do not fall obviously into any particular group, and could not be mistaken for any other species, but the appendix to the ductus bursae is a little reminiscent of *robiginascens* Prout, 1926, and this species could be related to it. There is also some similarity in the pattern of the genitalia to *gummaensis* Inoue, 1980.

Holotype. ♀, China, Sichuan, Pinglu, Wanglang, 1,100 m, 2. viii. 1999, leg. Zhou Kan, slide no. L-3148 (IZCAS).

***Eupithecia fulvidorsata* Mironov & Galsworthy, sp. nov.** (Fig. 6)

Description (♂). Wingspan 15–17 mm; fore wing 8.5–9.0 mm. Fore wing rather broad with slightly bowed costa and termen; apex tapered; ground colour grey; transverse lines invisible; costal margin darker, almost black, especially in the middle and towards apex; terminal area slightly darker, dark grey with narrow light wavy subterminal line; terminal line narrow, black, interrupted by veins; discal dot relatively large, ovate, black. Fringes light grey, almost unicolorous, only slightly spotted with dark grey at vein endings. Hind wing rather broad, with slightly concave termen; ground colour slightly lighter than fore wing; transverse lines inconspicuous; terminal line as fore wing; discal dot circular, smaller and paler than on fore wing; fringes as fore wing. Head, notum and abdomen covered with rusty ochreous scales.

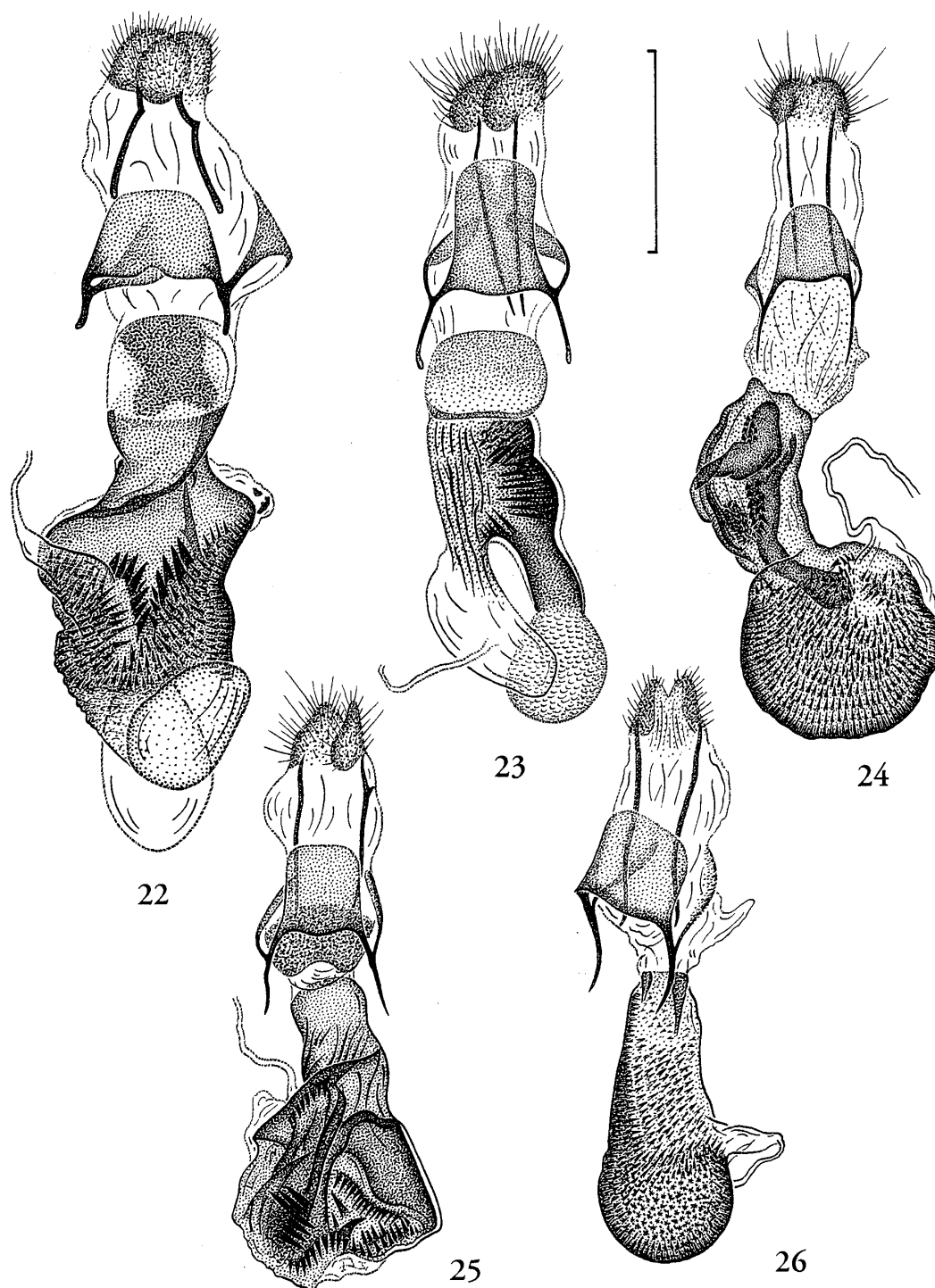
Male genitalia (Fig. 21). Uncus medium sized, biapical. Valve with two heavily sclerotized, prominent, blunt ventral processes and a narrow and deep hollow between them; apex of valve narrowly rounded; sacculus heavily sclerotized. Vinculum large, relatively long and wide, trapezoid. Papillae on the anterior arms of labides of medium size, unmodified. Aedeagus rather slim, equal to or slightly shorter than length of valve. Vesica armed with three relatively short, slightly curved horn-like cornuti (one an apical cornutus with blunter tip), one elongate and twisted V-shaped plate with two pointed ends of which one is longer than the other, and connecting with a small irregular plate near ductus ejaculatorius base. Sternite A8 heavily sclerotized, short, triangular, basally broadened, with more sclerotized lateral margins and two diverging, short and blunt apical rods; basal hollow narrow and deep.



Figs 19–21. Male genitalia of *Eupithecia* species (scale bar=1 mm; with sternite A8; lateral view of uncus and papilla on the anterior arm of labides enlarged). 19. *E. nirvana* sp. nov. 20. *E. magica* sp. nov. 21. *E. fulvidorsata* sp. nov.

Female unknown.

Range. Central China. Known from Shaanxi province.



Figs 22–26. Female genitalia of *Eupithecia* species (scale bar=1 mm). 22. *E. nirvana* sp. nov. 23. *E. phantastica* sp. nov. 24. *E. serpentigena* sp. nov. 25. *E. actrix* sp. nov. 26. *E. villica* sp. nov.

Similar species. Very similar to Nepalese *Eupithecia seditiosa* Vojnits, 1981, but distinguished by the rusty ochreous head, notum and abdomen, and the darker hind wing. The male genitalia of the two species are quite different. The structure of the male genitalia of *seditiosa* is unique, in particular the shape of the valve with two prominent, heavily sclero-

tized blunt ventral processes and narrow and deep hollow between them. The shape of the eighth sternite is rather similar to that of Himalayan *Eupithecia concinna* Vojnits, 1983, but this species is quite different both externally and in the rest of the male genitalia structure.

Holotype. ♂, C. China, prov. Shaanxi, Foping Natural Reserve, Panda area, 1,600 m, 20. iv–11. v. 1999, 33°45'N 107°48'E, leg. V. Siniaev & A. Plutenko (ZFMK). Paratype. 1 ♂, locality as holotype (ZFMK).

***Eupithecia atuni* Mironov & Galsworthy, sp. nov.** (Fig. 7)

Description (♂♀). Wingspan 19–22 mm; fore wing 10–11 mm. Fore wing rather elongate; costa and termen slightly bowed; apex more or less pointed; ground colour pale buff; antemedian area more or less pale; transverse lines brown, oblique, sharply angled near costa; medial area brown, giving effect of a transverse band across the wing; postmedial line slightly curved inward and obtusely angled onto costa; terminal area pale buff in the middle and brown near apex, tornus and along terminal margin; whitish subterminal line narrow, strongly wavy near costa, but rather straight along rest of length; terminal line dark brown, interrupted by vein endings; discal dot large, circular or ovate, brownish black. Fringe pale brownish grey chequered brown at vein endings. Hind wing rather elongate, paler; basal, ante- and postmedian lines clear, brownish; terminal area slightly darker, whitish brown with clear whitish wavy subterminal line; terminal line and fringes as fore wing; discal dot small, circular, blackish.

Male genitalia (Fig. 27). Uncus large, broad and stout, biapical. Valve long and broad with long finger-like sclerotized ventral process; sacculus heavily sclerotized. Vinculum medium sized, trapezoid. Papillae on the anterior arms of labides large, elongate and wide, covered with short setae on the tips and inner sides. Aedeagus large, long and stout, longer than valve length, broadened anteriorly. Vesica armed with one very long, longitudinally twisted, tapered plate, one large irregular plate near ductus ejaculatorius base and one large and wide apical plate, with bluntly rounded tip. Sternite A8 slightly sclerotized, peg-like, with two short and blunt apical rods; basal and apical hollows shallow.

Female genitalia (Fig. 30). Bursa copulatrix large, elongate, irregular pouch-like, almost completely covered with numerous small spines except ductus bursae near colliculum and diagonal area near ductus seminalis base extending along the ventral side. Ductus bursae has some short longitudinal striations. Ductus seminalis broadened basally, curved and adpressed to corpus bursae; attached to bursa copulatrix near its base on the left side. Colliculum collar-like, narrow and slightly elongate. Antrum membranous. Tergite A8 relatively small, trapezoid or almost semicircular, with a small medial hollow on the posterior margin. Anterior and posterior apophyses short and narrow. Papillae anales short and wide, rounded.

Range. South western China. Known from Yunnan province.

Similar species. This species belongs to the *lanceata* group. It is similar to *Eupithecia daemionata* Dietze, 1904 and *E. kudo*i Inoue, 1983 and can easily be confused with both these species. However, in comparison with *E. daemionata*, the basal area of the fore wing is lighter, the antemedian line more sharply angled with respect to the costa, while the postmedian line forms a right angle onto the costa, and the medial part of the terminal area is lighter; on the hind wing the postmedian line is less curved and runs nearer to the base of the wing. *E. atuni* can also be distinguished from Taiwanese *E. kudo*i by the angled postmedian line onto the costa of the fore wing. The male genitalia distinguish *E. atuni* from all other allied species of the *lanceata* group, in particular the long finger-like ventral process

on the valve, the large, broad and stout uncus, the long and stout aedeagus, and the cornuti on the vesica. The female genitalia of *E. atuni* are also very distinct, resembling somewhat those of Taiwanese *Eupithecia funerea* Inoue, 1988.

Holotype. ♂, [China], Nord-Yünnan, A-tun-tse, Talsohle ca 3,000 m, 30. 5. 1937, H. Höne (ZFMK). Paratypes. 22 ♂ ♀, locality as holotype, 26. 5–6. 6. 1937, H. Höne (ZFMK).

Remarks. This species was named “*atuni*” and marked as a new by Dr A. Vojnits. However, no description was ever published. We have decided to keep the name “*atuni*”, which refers to the type locality of A-tun-tse, for this species.

***Eupithecia phantastica* Mironov & Galsworthy, sp. nov. (Fig. 8)**

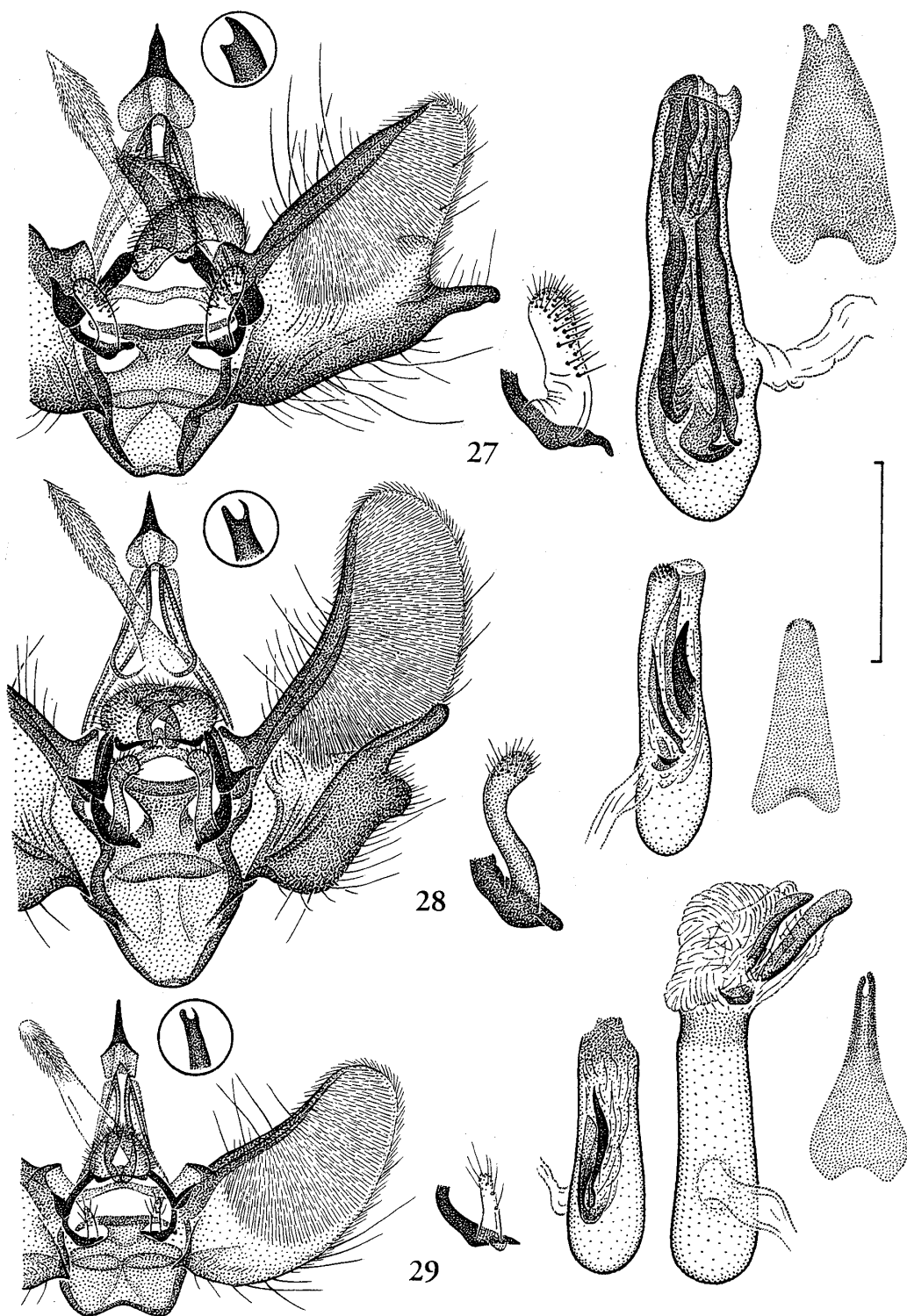
Description (♂ ♀). Wingspan 21–22 mm; fore wing 11.5–12 mm. Fore wing broad, apex well rounded, especially in female, costa slightly arched, termen rounded; ground colour pale brown; basal and antemedian lines oblique, sharply angled near costa, especially the latter; postmedian line oblique, slightly wavy; median fascia between antemedian and postmedian sharply narrowed near discal dot and darker near costa, forming a distinct brown triangle with base along costa and apex crossed by narrow and elongate black discal spot; terminal area also darker, its inner border crenulate, and marked with dark spots on the veins, and crossed by a wavy whitish subterminal line; terminal line narrow, black, interrupted by veins. Fringes long, chequered brown and pale grey. Hind wing broad, apex a rounded right angle, termen with clear shallow medial emargination; ground colour whitish grey; transverse lines well marked by a series of dark dashes on the veins; discal dot narrow and elongate but smaller and paler than on fore wing; terminal line and fringes as fore wing.

Male genitalia (Fig. 28). Uncus medium sized, biapical. Valve large, elongate and curved, with two weakly prominent, blunt and heavily sclerotized ventral processes and broadly rounded apex; sacculus heavily sclerotized. Vinculum rather narrow and slightly elongated, tapered anteriorly. Papillae on the anterior arms of labides sclerotized (unusually), elongate, S-shaped. Aedeagus slim, considerably shorter than length of valve. Vesica armed with two slim, slightly curved, horn-like cornuti (one longer, thinner and less sclerotized than the other), one elongate, clavate apical cornutus covered with minute teeth on its broadened apex and one weakly curved and twisted elongate plate connecting with a small, irregular plate near the ductus ejaculatorius base. Sternite A8 peg-like, narrow and elongate, without apical rods but with two heavily sclerotized lateral blotches near apex; basal hollow shallow.

Female genitalia (Fig. 23). Bursa copulatrix small, bipartite: its left part heavily sclerotized with an apical globular, thick-walled diverticulum and a small patch of spines posteriorly; the right part less sclerotized with longitudinal striations and an elongated, membranous diverticulum at apex. Ductus bursae not expressed. Ductus seminalis very narrow, attached to median part of membranous diverticulum. Colliculum expanded into a broad trapezoid shape, replacing ductus bursae. Antrum short and broad, plate-like, slightly sclerotized. Tergite A8 elongate and narrow, lightly sclerotized. Anterior and posterior apophyses of average length, narrow; anterior apophyses slightly expanded at their apices. Papillae anales average-sized, rounded, covered with long setae.

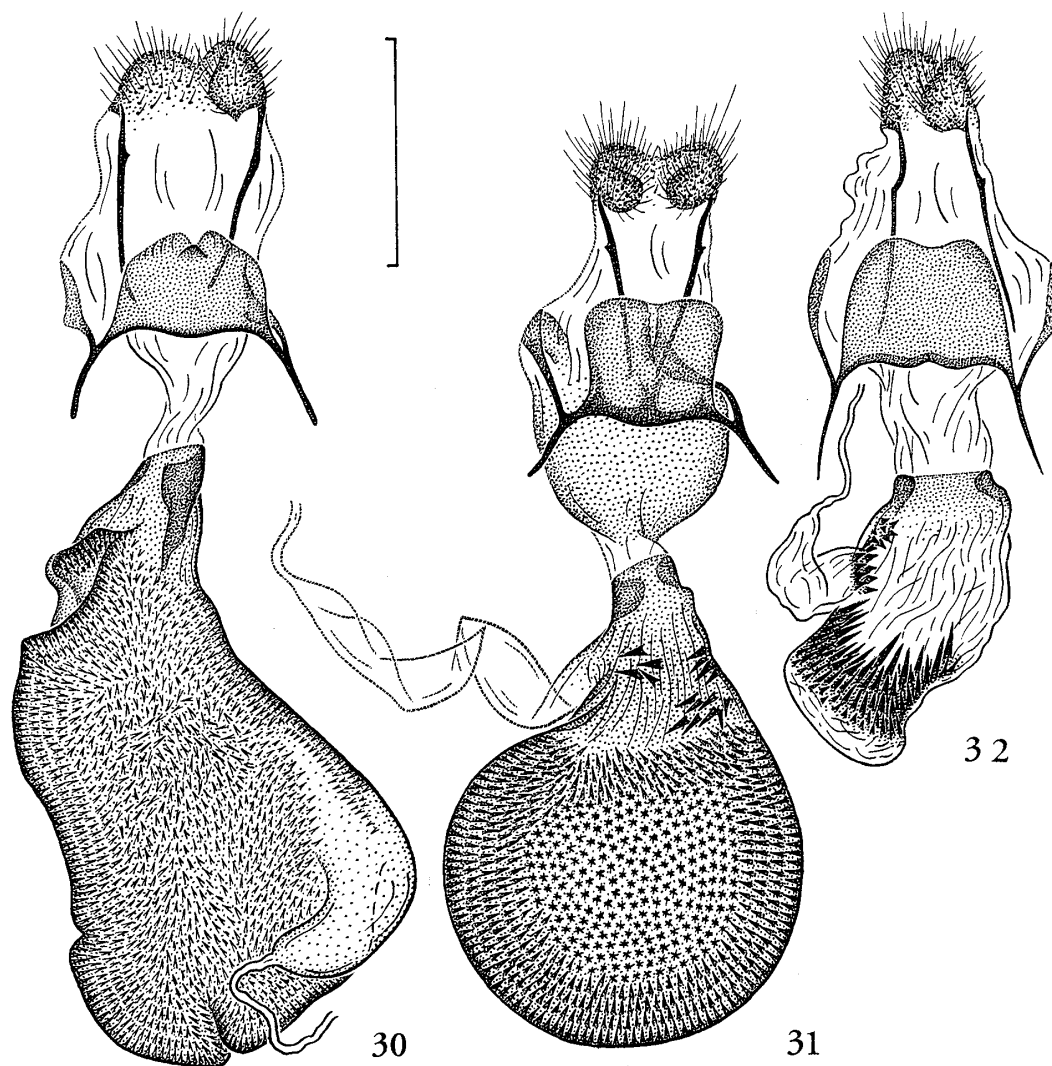
Range. Eastern China. Known from Zhejiang and from Taiwan.

Similar species. This species belongs to the *lanceata* group, and is very similar externally to the East Asian *longipennata* Inoue, 1988 and *takao* Inoue, 1955 and *E. habermani* Viidalepp & Mironov, 1988 and could be confused with these species. *E. phantastica* is dis-



Figs 27–29. Male genitalia of *Eupithecia* species (scale bar=1 mm; with sternite A8; papilla on the anterior arm of labides enlarged). 27. *E. atuni* sp. nov. 28. *E. phantastica* sp. nov. 29. *E. villica* sp. nov.

tinguished from both allied species by its smaller size and lighter ground colour, especially the less elongate and pointed fore wings, and from *E. takao* by the larger and more elongate discal dots on the fore wings. The male genitalia of *E. phantastica* clearly differ from those



Figs 30–32. Female genitalia of *Eupithecia* species (scale bar=1 mm). 30. *E. atuni* sp. nov. 31. *E. magica* sp. nov. 32. *E. severa* sp. nov.

of both compared species in the shape of the ventral processes on the valve, the elongate and S-shaped papillae on the anterior arms of the labides, and the shapes of the cornuti on the vesica and of the eighth sternite.

Holotype. ♂, [China], West-Tien-Mu-Shan (1,600 m), Pz. Chekiang, 10. 11. 1932, H. Höne, 35721 (ZFMK). Paratypes. 1 ♂ 1 ♀, Taiwan, Prov. Nantou, Hohuachi, 1,950 m, 24°13'N, 121°16'E, 28. xi. 1999, leg. A. Kun, L. Peregovits & L. Ronkay (ZSM).

Remarks. The holotype male is worn, with the fringes completely worn out on all wings.

The male genitalia of Taiwanese specimens are larger, on the whole, than in the single known continental specimen: the valve, vinculum and aedeagus are slightly longer, and the eighth sternite slightly different, with two short and blunt apical rods.

***Eupithecia actrix* Mironov & Galsworthy, sp. nov. (Fig. 9)**

Description (♀). Wingspan 17 mm; fore wing 8.5 mm. Fore wing elongate, narrow with bowed costa, oblique and bowed termen and pointed apex; ground colour pale brownish

grey; three median transverse lines inconspicuous, forming oblique dark costal spots; terminal line narrow, continuous, brown; discal dot small, rounded, black. Hind wing rounded triangular, terminal margin slightly sinuous; ground colour pale brownish grey; transverse lines inconspicuous; terminal line as fore wing; discal dot very small, circular.

Female genitalia (Fig. 25). Bursa copulatrix small, heavily sclerotized, in large irregular folds; it has a long curved chain of different sized spines near base and a short chain of small spines near base of ductus seminalis. Ductus bursae relatively narrow, heavily sclerotized, with some longitudinal striations. Ductus seminalis narrow; attached to membranous swelling in the middle part of the bursa copulatrix from the right side. Colliculum not expressed. Antrum heavily sclerotized, covered with numerous small pores. Tergite A8 small, elongate. Anterior and posterior apophyses narrow and short, tapered to tips. Papillae anales small, short, slightly tapered.

Male unknown.

Range. Central China. Known from Shaanxi province.

Similar species. This species undoubtedly belongs to the *egenaria* group. It is similar to *Eupithecia tricornuta* Inoue, 1980, but distinguished by the smaller size and narrower wings; on the fore wing, the postmedian line is closer to the discal dot, and the discal dot is smaller and more rounded; on the hind wing, the discal dot is also smaller and more rounded than in *E. tricornuta*. The female genitalia are similar to those of *E. recens* Dietze, 1904, *E. detritata* Staudinger, 1897, *E. jinboi* Inoue, 1976, *E. irreperita* Vojnits & De Laever, 1978, and especially *E. tricornuta* Inoue, 1980. It is however clearly distinguished by the smaller size, the absence either of an oblique membranous band in the ductus bursae or a large membranous diverticulum near the base of the corpus bursae and also by the different disposition of spines in the bursa copulatrix.

Holotype. ♀, Central China, prov. Shaanxi, Mt Tai Bei Shan Mts, 1,300–1,500 m, 33°35'N 107°43'E, 10. viii–4. ix. 1998, leg. V. Murzin & V. Siniaev (ZFMK).

Remarks. The unique holotype female, possibly belonging to a smaller second generation, is in worn condition, and the fringes are worn off on all wings.

***Eupithecia severa* Mironov & Galsworthy, sp. nov.** (Fig. 10)

Description (♀). Wingspan 18 mm; fore wing 10 mm. Fore wing rather elongate and narrow with pointed apex; costa and termen slightly bowed; ground colour pale brownish grey with yellowish tinge, rather uniform; transverse lines inconspicuous, mainly evident as darker brown costal blotches; median and postmedian lines faintly visible, obtuse angled near costa; terminal line brown, continuous and narrow; discal dot small, rounded. Hind wing rather elongate, with concave terminal margin near apex and more or less pointed apex; concolorous with fore wing but slightly lighter; dark transverse lines well marked along anal margin only; terminal line as fore wing; discal dot inconspicuous.

Female genitalia (Fig. 32). Bursa copulatrix small, membranous, with sclerotized spineless base, armed with one patch of large spines near base and a separate smaller patch of small short spines near base of ductus seminalis. Ductus bursae not expressed. Ductus seminalis curved, basally broadened, attached to the middle of corpus bursae on the right side. Colliculum collar-like, short and broad, lightly sclerotized. Antrum membranous. Tergite A8 broad, trapezium shaped, with narrowly sclerotized anterior margin. Anterior and posterior apophyses narrow, tapered, relatively long. Papillae anales small, relatively short and

narrow, rounded.

Male unknown.

Range. Central China. Known from Shaanxi province.

Similar species. This species is similar to *Eupithecia thalictрата* (Püngeler, 1902) in size and colour, but easily distinguished from it by the structure of the female genitalia. It can also be distinguished externally from *E. thalictрата* by the slightly narrower wings with more pointed apices and the more obtusely angled median line near the costa of the fore wing. The female genitalia are similar to those of Central Asian *Eupithecia chesiata* Dietze, 1904, but the disposition of spines differs, the base of the ductus seminalis is broader, the colliculum broader and shorter, the apophyses longer, and the eighth tergite lacks a narrow and deep median gap on its posterior margin.

Holotype. ♀, China-Shaanxi, South Taibai Shan, Tsinling Mts, Houzhenzi, 33°53'N 107°49'E, 16–21. v. 2000, 1,500 m, leg. Siniaev & Plutenko (ZSM).

Remarks. The unique holotype female is in worn condition, and the fringes are worn away on all wings.

***Eupithecia magica* Mironov & Galsworthy, sp. nov.** (Fig. 11)

Description (♂ ♀). Wingspan 20–21 mm; fore wing 11–12.5 mm. Fore wing narrow, elongate with slightly bowed costa, oblique termen and markedly pointed apex; ground colour pale brownish grey; transverse lines dark brown, oblique, sharply angled near costa; ante-median line doubled below angle, with an inward-projecting crenulation at edge of discal space; postmedian line stronger, especially near anal margin; outside postmedian line a broad, paler fascia, with a number of faint undulating transverse lines; terminal area darker, light brown with an inconspicuous, pale wavy subterminal line, the darker area extended basad in a projecting spike close to costa; terminal line narrow, brown, continuous; discal dot rounded or narrow and elongate, black. Fringes pale brownish grey slightly chequered light brown. Hind wing elongate, ovoid; ground colour pale brownish grey, paler than fore wing; transverse lines oblique, brown, well marked along anal margin only, especially ante-median; discal dot indistinct, narrow and oblique; terminal line and fringes as fore wing.

Male genitalia (Fig. 20). Uncus relatively short, pointed, biapical. Valve shaped like an orange segment, without ventral process and with narrowly rounded apex; sacculus slightly sclerotized. Vinculum short, rather narrow, trapezoid. Papillae on anterior arms of labides elongate, moderately broad, sclerotized, covered with sparse and short setae on their apices. Aedeagus rather slim, shorter than valve length. Vesica armed with one small, elongate and broad, heavily sclerotized anterior plate and one smaller, irregular plate near ductus ejaculatorius base. Sternite A8 short, strongly broadened basally, with two parallel, narrow and pointed apical rods; basal hollow shallow; apical hollow membranous, deep and narrow.

Female genitalia (Fig. 31). Bursa copulatrix large, pear-shaped, completely covered with small spines. Ductus bursae relatively short, sclerotized, with longitudinal striations and two small patches of larger spines (one patch on the left wall and the other near the base of the ductus seminalis). Ductus seminalis long, probably evenly curved along corpus bursae in natural condition, attached to ductus bursae near colliculum at the right side. Colliculum collar-like, small, short and narrow, slightly inclined to right side. Antrum broad, campaniform, sclerotized. Tergite A8 almost square with prominent and heavily sclerotized anterior margin, rounded posterior angles and deep, narrow medial hollow on the posterior margin. Anterior and posterior apophyses moderately thick and short, especially posterior apophy-

ses. Papillae anales medium-sized, wide and rounded.

Range. South western China. Known from Tibet.

Similar species. This species belongs to the *innotata* group and is very similar to the Central Asian *Eupithecia vicariata* Dietze, 1904. We can find no clear and significant differences between the external features of these two species, and they must be distinguished by the male and female genitalia. Both male and female genitalia of *E. magica* are rather similar to those of another allied Central Asian species *Eupithecia relaxata* Dietze, 1904, but the vinculum is broader, the papillae on the anterior arms of the labides are shorter and sclerotized, the apices of the posterior lobes of the juxta ("anellus lobes" in Pierce, 1914) are narrower and pointed in the male, and the ductus bursae has two separate small patches of spines in the female which clearly distinguish this species from *E. relaxata*. It is worth adding that only two known species from the *innotata* group, *E. relaxata* and *E. magica* lack two horn-like cornuti and an elongated patch of spinules on the vesica in the male genitalia.

Holotype. ♂, [China], Batang (Tibet), Im Tal des Yangtze, ca 2,800 m, 28. viii. 1936, H. Höne; De Laever slide no. 437 (ZFMK). Paratype. 1 ♀, data as holotype, 4. ix. 1936; De Laever slide no. 438 (ZFMK).

Remarks. The aedeagus tube in the genitalia slide no. 437 is damaged and is heavily flattened, as in many other genitalia slides of De Laever (ZFMK).

***Eupithecia villica* Mironov & Galsworthy, sp. nov.** (Fig. 12)

Description (♂♀). Wingspan 17–19mm; fore wing 9–10.5mm. Fore wing elongate, very rounded at apex and tornus, the dorsum and termen forming a continuous curve. Ground colour pale yellowish buff. Transverse lines absent, except for a faint and narrow brown postmedial, very sharply angled at the level of the discal dot, and thereafter running obliquely almost straight to the dorsum. Discal dot minute, dark brown. A series of brown subterminal dots on the veins. Terminal line dark brown; fringes buff. Hind wing short and rounded, white with a minute discal dot; transverse lines present only as very obscure buff markings close to anal margin. Abdomen light yellowish ochreous.

Male genitalia (Fig. 29). Uncus narrow, elongate, biapical, with narrow base. Valve short and broad, shaped like an orange segment, with evenly curved ventral margin and broad, rounded apex; sacculus slightly sclerotized. Vinculum short and broad, with shallow medial hollow. Papillae on the anterior arms of labides small, narrow and elongate, covered with some long setae. Aedeagus slim, shorter than valve length. Vesica armed with two relatively large, elongate and broad, plates (one obtusely pointed and the other blunt with rounded apex) and one smaller, irregular plate at the base of these plates and base of ductus ejaculatorius. Sternite A8 peg-like, elongate, sharply narrowed to apex, with two more sclerotized, unequal, narrow, short and blunt apical rods; basal hollow shallow, apical hollow narrow and shallow.

Female genitalia (Fig. 26). Bursa copulatrix small, elongate, pear-shaped, almost completely covered with small spines from base to colliculum except posterior half on dorsal side and along left side. Ductus seminalis broadened at base, attached to middle of corpus bursae on left side. Colliculum collar-like, small, relatively short and rather broad. Antrum membranous. Tergite A8 almost quadrate with rounded posterior corners. Anterior and posterior apophyses moderately thick, medium length. Papillae anales small, relatively short and narrow, tapered to apices and covered with short setae.

Range. South western China. Known from Tibet and Yunnan province.

Similar species. This species does not belong to any obvious species group. The combination of features including externally the unusual sandy coloration, and in the genitalia, the thin, elongate uncus with a narrow base; the broad valve with a broadly rounded apex; the broad vinculum with a medial hollow; the shape of the cornuti on the vesica and the shape of the eighth sternite, separate this species from all other known Chinese *Eupithecia*. The female genitalia are similar to those of *E. tibetana* Mironov & Galsworthy, 2004, but are distinguished from it by the larger spiniferous area from the base of corpus bursae to the base of colliculum.

Holotype. ♀, Tibet, Jiangda military post, 3,400 m, 24. vii. 1976, leg. Zhang Xuezhong, slide no L-2966 (IZCAS). Paratypes. 1 ♀, Tibet, Leiwuqi, 3,750 m, 29. viii. 1976, leg. Zhang Xuezhong; 1 ♂, Li-kiang (China), Provinz Nord-Yuennan, 1. x. 1934, H. Höne, genitalia slide no ACG Bonn 10; 1 ♂, Tibet, Batang, Untere Urwaldzone, (ca 3,800 m), H. Höne, Vojnits slide no 13266 (ZFMK).

Remarks. The apices of both valves and the eighth sternite are missing in Vojnits slide no.13266 (ZFMK).

References

- Mironov, V., Galsworthy, A.C. & D. Xue, 2004a. New species of *Eupithecia* (Lepidoptera: Geometridae) from China, part I. *Trans. lepid. Soc. Japan* **55**: 39–57.
 ———, 2004b. New species of *Eupithecia* (Lepidoptera: Geometridae) from China, part II. *Trans. lepid. Soc. Japan* **55**: 117–132.
 ———, 2004c. New species of *Eupithecia* (Lepidoptera: Geometridae) from China, part III. *Trans. lepid. Soc. Japan* **55**: 225–242.
 ———, 2004d. New species of *Eupithecia* (Lepidoptera: Geometridae) from China, part IV. *Trans. lepid. Soc. Japan* **55**: 285–300.
 Pierce, F. N., 1914. The Genitalia of the Group Geometridae of the Lepidoptera of the British Islands. xxix, 88 pp., 48 pls. Liverpool.

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摘 要

中国のカバナミシヤク属 (5) (V. MIRONOV · A. C. GALSWORTHY · 薛 大勇)

第4報までと同じように、中国産カバナミシヤク属 *Eupithecia* の12新種を記載した。今回記載した新種は次の通りである。 *E. blenna* Mironov & Galsworthy (四川, 陝西), *E. verprota* Mironov & Galsworthy (陝西), *E. spissata* Mironov & Galsworthy (四川), *E. nirvana* Mironov & Galsworthy (四川), *E. serpentigena* Mironov & Galsworthy (四川), *E. fulvidorsata* Mironov & Galsworthy (陝西), *E. atuni* Mironov & Galsworthy (雲南), *E. phantastica* Mironov & Galsworthy (浙江, 台湾), *E. actrix* Mironov & Galsworthy (陝西), *E. severa* Mironov & Galsworthy (陝西), *E. magica* Mironov & Galsworthy (チベット), *E. villica* Mironov & Galsworthy (チベット, 雲南)。

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